



**NC Conservation Reserve
Enhancement Program
2009 Annual Report**

Submitted by the
NC Department of Environment and Natural Resources
Division of Soil and Water Conservation

Introduction

The North Carolina CREP celebrated its 10 year anniversary in 2009. When the initial Memorandum of Agreement established the North Carolina Conservation Reserve Enhancement Program (NC CREP) there were high expectations for the program. The goal of the program was to enroll 100,000 acres of environmentally sensitive land within the Chowan, Neuse and Tar-Pamlico river basins, as well as the Jordan Lake watershed area. Through local interest and demonstration of environmental need, North Carolina requested the program to be expanded to cover 75% of the state. On May 1, 2008, the Lumber, White Oak, Yadkin-PeeDee, Roanoke, Cape Fear and Pasquotank river basins became eligible to participate in CREP.

Establishment of NC CREP provides a voluntary initiative encouraging the enrollment of farmland and marginal pastureland into long term agreements to restore and protect riparian buffers and wetlands. Practices are designed to reduce nutrient and sediment impacts to stream courses within the targeted area. The CREP will have a positive impact on overall water quality within the targeted area.

The strong partnership between the Farm Service Agency (FSA), Natural Resources Conservation Service (NRCS), N.C. Division of Soil and Water Conservation (DSWC), and the Department of Environment and Natural Resources (DENR) provides an extremely efficient mechanism for program delivery and implementation. Funding for the State's 20 percent match requirement is obtained from the N.C. Clean Water Management Trust Fund (CWMTF), the NC General Assembly and the N.C. Agriculture Cost Share Program. North Carolina continues to explore additional partners for its CREP.

Accomplishments

CREP Enrollment

Interest in the NC CREP is increasing, especially in the Piedmont counties. Historically, the program has enrolled majority of the acreage on row crop farms. Now, however, we are working with more pasture operations by establishing buffers and requiring cattle exclusions.

	Program Year 2009		Cumulative	
	Number of Acres	Estimated Federal Cost Share	Number of Acres	Estimated Federal Cost Share
CP3	2.5	\$263	55.3	\$8,975
CP3A	392.1	\$61,879	1723.7	\$221,602
CP21	3	\$15	1985.2	\$473,201
CP22	112.6	\$67,133	26637.9	\$2,036,106
CP23	0	\$0	2011.5	\$311,818
CP31	6.3	\$710	6.3	\$710
Total	516.5	\$129,027	32,423	\$3,052,412

The following table shows the enrollment acres by county for program year 2009 as well as cumulative data. Take note that approximately 78% of the total enrollment is protected through long term conservation easements. This is protecting approximately 896 stream miles.

County	Program Year 2009			Cumulative to Date			
	Number of Contracts	Number of Acres	Miles of Buffer	Number of Contracts	Number of Acres	Miles of Buffer	Total Acreage in long-term easements
Alamance			0.00	1	2	0.06	0.00
Beaufort	7	81.6	2.24	145	1974.6	54.30	1263.75
Bertie			0.00	53	442.2	12.16	30.10
Caswell			0.00	2	10.2	0.28	0.00
Chatham			0.00	1	30.7	0.84	30.70
Chowan			0.00	48	349.4	9.61	154.78
Craven	1	32.2	0.89	102	1866.1	51.32	1609.25
Duplin			0.00	0	0	0.54	0.00
Edgecombe	3	19.5	0.54	227	3362.5	92.47	2631.66
Gates	1	0.9	0.02	128	1660.3	45.66	1566.86
Granville	1	0.5	0.01	32	403.4	11.09	218.82
Greene			0.00	108	750.7	20.64	424.44
Halifax			0.00	287	4573.1	126.41	4005.73
Hertford			0.00	123	1759.2	48.38	1522.40
Hyde			0.00	107	4122.5	113.86	3941.00
Johnston	1	16.9	0.46	114	646.9	18.06	191.45
Jones			0.00	14	234.6	6.45	226.28
Lenoir			0.00	148	1263.4	34.74	627.14
Martin	8	197.8	5.44	132	1744.9	47.98	1361.77
Nash			0.00	48	1029.9	28.32	870.34
Northampton	2	41.4	1.14	196	2273.6	63.00	1815.29
Orange			0.00	1	5	0.14	5.10
Pamlico			0.00	17	242.6	6.67	221.95
Perquimans	1	3.2	0.09	1	3.2	0.09	3.20
Person			0.00	1	2.4	0.07	0.00
Pitt			0.00	57	648.5	18.11	543.91
Randolph	3	27.3	0.75	3	27.3	0.75	30.36
Robeson	1	17.7	0.49	1	17.7	0.49	17.70
Rockingham			0.00	5	42.8	1.18	0.00
Tyrrell	3	26.5	0.73	3	26.5	1.37	21.00
Vance	1	2.5	0.07	41	241	6.63	73.80
Wake			0.00	4	80.5	2.21	1.20
Warren			0.00	36	1079.1	29.68	964.52
Washington	1	48.5	1.37	13	618.9	17.98	850.01
Wayne			0.00	84	472.9	13.00	123.53
Wilson			0.00	58	414.1	11.64	186.73
Total	34	516.5	14.24	2341	32,423	896.18	25,535

In June 2009, the first CREP conservation easements in the expansion area were closed. This produced 81 acres in permanent easement and 3.2 acres in a 30-year easement. These properties were located in Randolph, Washington and Perquimans Counties. The following table reflects where landowner interest has been identified in the expansion areas, thus resulting in potential enrollments for the upcoming program year.

Cape Fear	Lumber	Pasquotank	Roanoke	Yadkin-PeeDee
Duplin Sampson Chatham	Robeson Columbus	Tyrell Perquimans Washington	Caswell Martin Rockingham Bertie	Randolph Surry Wilkes



First Permanent Conservation Easement in Expansion Area ~ Randolph County

Pasture landowners are particularly inquiring more about how CREP can benefit their operations. Many are willing to establish a buffer along their streams, while receiving up to 100% cost share benefits to install fencing, watering facilities, and stream crossings. Although these operations do not enroll large acreages, the water quality benefits are substantial when focusing on the stream miles that are being protected through conservation easements.

15-Year Contracts Upgraded to Permanent Easements

NC CREP has made progress to increase interest in permanent easements. This increase is attributed to enhanced marketing of the program, educating landowners about easements, simplified payment schedule and providing incentives to enroll existing forested areas. CREP continues to offer current enrollees the option to upgrade to a permanent conservation easement. Many Soil and Water Conservation Districts and partnering agencies encouraged landowners in their county to take advantage of this opportunity. Thus, Program Year 2009 has resulted in 72% of easement enrollments being for permanent easements. DSWC is striving to maintain this level of permanent easement enrollment.

The following table reflects the acreage upgraded to a permanent easement within this past fiscal year.

County	Acreage	Acquisition Payments
Edgecombe	125.58	\$ 106,002
Northampton	81.00	\$ 72,636
Pitt	24.80	\$ 20,661
Wilson	30.37	\$ 28,362
Total	261.75	\$ 227,661

Partnership at Its Finest

During the past program year, the DSWC CREP staff continued to promote effective communication between all partnering agencies. One of the best methods of ensuring success is for the initial site visit to be coordinated with the landowner and all partnering agencies. This approach ensures the landowner's request would be processed in a timely manner and decreases any landowner confusion that may inadvertently occur. Although scheduling can be a challenge, this method has proven to be one of the best opportunities for the landowner to understand the process that is required, the technical recommendations, and the easement options. Most importantly everyone is present to hear the landowner's goals and objectives for his property. We continue to have counties across the state adopt this approach as they implement CREP.



DSWC continued to implement on-site training sessions throughout the expansion area. In a joint effort with NRCS, three trainings were held to address how CREP could be utilized in their county. These trainings were for five to six counties and addressed a cropland and a pasture site each. We had excellent participation from local FSA, Division of Forest Resources, NRCS and Soil and Water Conservation District staff. These events also offered informal discussions on planning, contracting and easement processes. We

focused our efforts on planning for these sites and the coordination for each agency to complete their responsibilities such that the contracting process can be completed in a timely manner. The second site of the day, then allowed the attendees to work together and plan the site for themselves. Discussions revolved around the various scenarios and options that could be given to the landowner. Although no formal survey was conducted, the response from the attendees has been remarkable. It appears that many, primarily in the expansion area, better understand how a good CREP site looks and where it would fit on the landscape. Since the training we have seen increased interest in enrollment resulting from increased staff interest in promoting the program. Division of Soil and Water Conservation CREP staff will continue to offer these trainings to our local partners.

Water Quality and Wildlife Monitoring

2009 CREP Research Highlights

Since 2004, the NCSU Departments of Biological and Agricultural Engineering, Soil Science, and Forestry and Environmental Resources, have been conducting research of the ecological functions of riparian buffers in order to maximize water quality and habitat functions of future land enrollments into the NC CREP. This has been an extensive effort, and has supported or continues to support the research of 6 M.S. students and 1 Ph.D. student.

Over 200 water quality and water table monitoring wells, along with multiple surface water quality samplers, have been installed in this effort on 3 riparian buffer sites in Halifax County enrolled in the NC CREP. These sites vary in landscape position, widths, soils, agricultural practices, and qualifying water body, but all had a similar vegetation planting plan (grass buffer at the field edge, followed by pine plantings followed by a thin strip of hardwoods near the stream). Site 1 is a long narrow buffer (150 ft wide) of a 1st-order stream, down-slope of a poultry litter fertilized beef cattle pasture. Site 2 has two distinct buffer widths (225 ft and 140 ft), buffering a slow-moving 1st-order stream, down-slope of row crop agriculture. Site 3 is also down

slope of row-crop agriculture, but this buffer is 250 ft wide in a more upland position (i.e. out of the floodplain) and was designed to buffer an already well established floodplain swamp. The existing Riparian Ecosystem Management Model (REMM) is being calibrated with existing field data from these sites to make predictions of the long-term performance of these systems.

Data collection at another 200 water quality and water table wells at the Center for Environmental Farming Systems (CEFS) has extended a previous research dataset to include approximately 12 years of buffer observations. Buffers at this site are positioned to protect agricultural drainage canals near cattle pastures and row-crop agriculture, and include replicates that include various combinations of widths (25 ft and 50 ft) and vegetation types (switchgrass, native vegetation, pine trees, and fescue grass).

In addition, the Department of Forestry and Environmental Resources has completed an extensive survey of over 40 CREP sites with respect to early successional song-bird habitat. This two year study has concluded and the results are ready for publication.



NCSU students measuring water table depths ~ Photo Courtesy of NCSU

Preliminary conclusions



NCSU students check monthly rainfall ~ Photo Courtesy of NCSU

From a water quality standpoint, the primary focus of the monitoring project is to assess the ability of these buffers to remove excess nitrate-nitrogen ($\text{NO}_3\text{-N}$), a key pollutant that causes stream eutrophication (i.e. algal blooms and fish kills). To maximize the water quality benefit of NC CREP, stream miles protected must be maximized. To accomplish this, buffers should be designed to be placed in the most ideal locations, and at an ideal width. However, previous research shows that differences in width, soil type, landscape position, and vegetation type may impact the ability of these buffers to reduce groundwater nitrate. This makes it extremely difficult to predict how well NC CREP enrollments will perform to protect

water quality. Additionally, narrower buffer widths may reduce the effectiveness of these enrollments in providing suitable habitat for early successional bird species. Our research aims to study the existing benefits of enrolled buffers from both a water quality and habitat standpoint, while shedding some additional light on these complicated factors to help make recommendations for the NC CREP staff to improve the future CREP enrollments.

A few key observations that we have noted thus far include:

- Similar to previous research findings, buffer performance in this study is variable due to factors such as width, hydrology (seasonal variation), soils (type and dissolved carbon content) and pollutant load.
- Pollutant load seems to be variable in the groundwater along the field/buffer interface, increasing moving downstream to areas of lower elevations. This is most likely tied to how groundwater converges downstream, concentrating more $\text{NO}_3\text{-N}$ at these locations.
- $\text{NO}_3\text{-N}$ concentrations in groundwater can be significantly reduced as it passes through buffers. $\text{NO}_3\text{-N}$ is significantly reduced at all of our research locations near buffered areas of the stream when the entire year is considered. The NC CREP program will have a significant impact on water quality if buffers are enrolled in the most strategic locations.
- Buffer areas with frequent wet conditions typically remove the most nitrate-nitrogen. This is due to increased microbial denitrification in these locations. Many of these wet locations are at the downstream location where field edge $\text{NO}_3\text{-N}$ is the highest, so the most efficient areas for $\text{NO}_3\text{-N}$ are receiving the highest concentrations of $\text{NO}_3\text{-N}$, resulting in the highest removal efficiencies.

- As alluded to above, hydrology is a very critical component of buffer effectiveness in removing $\text{NO}_3\text{-N}$. Groundwater direction through the buffers actually varies seasonally. During wetter periods we have observed groundwater flow from field edge to stream is through the buffer, varying between perpendicular to 45 degrees from perpendicular in the downstream direction. Buffers can reduce nitrate prior to stream discharge under these conditions. However, during dry periods, groundwater may flow parallel or away from the stream, making it difficult to ascertain buffer performance during these periods. We believe that from a groundwater perspective, the impact of the buffers during these periods are likely low.
- Reduced $\text{NO}_3\text{-N}$ concentrations observed within the buffers may be influenced by deeper groundwater. If this was the case, $\text{NO}_3\text{-N}$ would not truly be removed by the buffer – it would just be diluted. Deep wells installed at 2 of the sites have been used to monitor $\text{NO}_3\text{-N}$, chloride (Cl^-) and cations (calcium and sodium). By studying the chemistry of this deeper water and the surficial groundwater passing through the buffer, we are attempting to determine how much dilution plays a role in reducing $\text{NO}_3\text{-N}$ concentrations. Initial indications are that dilution plays a minor role in reducing the concentration of $\text{NO}_3\text{-N}$ in the groundwater, and supports that denitrification is the primary mechanism for removal.
- From data collected from 2007-2009 at the replicated buffer study at CEFS, there were not any statistical difference in $\text{NO}_3\text{-N}$ reduction based on vegetation type, but this could be due to the high variability in the data and the large differences within replications. Therefore, switchgrass, trees, native vegetation, and fescue all appear to be equally effective in reducing $\text{NO}_3\text{-N}$. Wider buffers at the site (50 ft) show a trend towards greater $\text{NO}_3\text{-N}$ reduction than in narrow buffers (25 ft), and there was more reduction at the deepest groundwater depth due to a more reduced condition and presumably more denitrification.
- The CEFS study shows improved $\text{NO}_3\text{-N}$ removal when buffer width is increased from 25 to 50 ft. However, our observations indicate increased widths of buffers appear to have a point of diminishing return with respect to water quality, and few CREP buffers are less than 100 ft wide. It appears that buffers that extend outside the floodplain of a stream (i.e. are located in an upland land position) do not improve $\text{NO}_3\text{-N}$ removal. One of our research sites clearly displays this phenomenon. Groundwater $\text{NO}_3\text{-N}$ at site 3 does not diminish in the planted buffer until it reaches the fully established floodplain swamp. The agricultural field edge is over 225 ft from the swamp, and close to 350 ft to the main stream channel in the swamp.



NCSU students sample groundwater ~ Photo Courtesy of NCSU

- Calibrating existing computer models such as the Riparian Ecosystem Management Model (REMM) with our extensive field dataset, then modifying the model to require less inputs, may be beneficial in predicting performance of future buffers enrolled in the NC CREP.
- Increased buffer widths of recently replanted buffers favors presence and nesting of early successional bird species. This presents a potential dilemma in making future enrollment recommendations for buffer width in NC CREP. This completed research may also have implications on the design of conservation land enrollments in other programs outside the realm of NC CREP.

A website has been developed to show all of the research and results for the above mentioned monitoring conducted by North Carolina State University.

<http://www.bae.ncsu.edu/topic/riparian-buffers/>

Table N, P, Soil Reduced – Stream Miles Protected

Based on estimates of the environmental benefits of installed practices NC CREP estimates the following nutrient and sediment reduction benefits:

Stream Miles Protected	Sediment Reduction	Nitrogen Reduction	Phosphorus Reduction
896 miles	239,323 tons	1,8889,680 lbs	437,308 lbs

Nitrogen and phosphorus estimates were calculated using the North Carolina Agricultural Nutrient Assessment Tool (NCANAT). Tons of soil saved was calculated using the Revised Universal Soil Loss Equations (RUSLE).

Easement Stewardship

DENR Stewardship Database

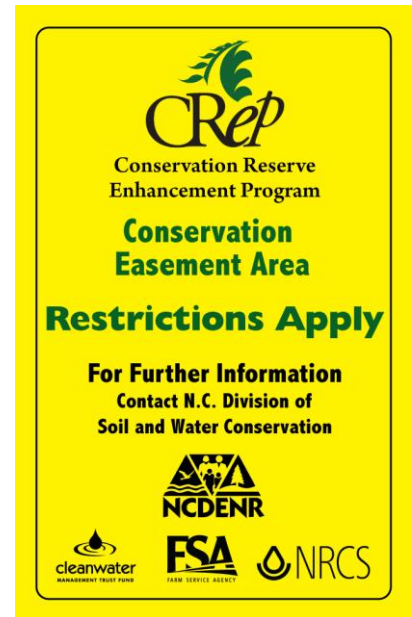
CREP easements have been included in the DENR online Property Stewardship Database. This online portal will allow improved monitoring of the CREP easements such that you can upload pictures, view previous site conditions, and more efficiently track changes in ownership. We are excited to be able to utilize this tool as we continue to monitor our easements.

Marking of Easement Boundaries

In effort to prevent easement violations, the DSWC is in the process of purchasing boundary signs. The design has been approved and awaiting approval to purchase. These signs will be placed at strategic locations on the property in hopes to deter violations and/or inform permitting agencies of present easements.

Easement Violation

The DSWC is currently dealing with a easement violation in Lenoir County. The property owner allowed mining activity to take place on the property. In working with Division of Land Resources and the Attorney General's Office we are hopeful that we will be able to get the situation resolved. In addition to the signage, CREP staff is reviewing all mining permits until another alternative is presented.



Challenges

Federal Caps on Pasture BMPs

Since the expansion of CREP we have experienced quite a bit of interest in the western piedmont of North Carolina. Most of these enrollees or potential enrollees are pasture operators who are opting to enroll in permanent easements. NC CREP allows up to 100% cost share to install the practice on those permanent easements enrollments. Unfortunately, CRP has maximum caps established for several components for CP22 Riparian Buffer on marginal pastureland. These caps on the following BMPs were becoming a hindrance for landowners when deciding to commit to CREP. This is a concern because the landowners would still have to meet NRCS

standard for fencing, watering facilities and livestock crossings however they would not be receiving the 100% cost share as initially understood.

- Cost share for the total of all water developments per contract shall not exceed \$3,000
- Cost share for the total of all water facilities per contract shall not exceed \$2,000
- Cost share for the total of all pipelines shall not exceed \$2,000
- Cost share for all livestock crossings is limited to \$1,500 per contract



In an effort to uphold the policy of 100% cost share on these easements, the NC Agriculture Cost Share Program has agreed to reimburse the difference. The Division of Soil and Water Conservation is committed to continue this practice as long as funding is available; however we have requested more information from the Farm Service Agency State Office regarding the maximum payments.

State Budget Restraints

The state budget deficits have taken a toll on the DSWC's budget, like all state agencies. The DSWC pursued and was awarded appropriated funding from the General Assembly to assist with the acquisition for CREP easements. A recurring appropriation of \$579,800 since FY2008 has been received. In response to the state's budget deficits, NC CREP specifically has reverted \$260,910. Our proposed reversion thus far for FY2010 is \$260,622; a balance of approximately \$1.3 million would remain. The Division also reduced the initial awarded grant amount for a Clean Water Management Trust Fund grant by \$3,064,121.

Although these budget restraints have been a challenge for all state agencies, the DSWC is still committed to continue to implement the program at its fullest ability. We have taken measures to ensure that landowner and partnering agencies needs are met while adhering to travel and purchasing restrictions. During this time, we have been able to reorganize priorities and focus on training and marketing initiatives which present positive results. For example, staff has reduced travel to meetings by utilizing conference calls and web meetings instead. This measure allowed our travel budget to be focused on partnership training, site visits and landowner conferences. We are hopeful that the adopted internal measures will allow us to continue the expected level of customer service to our clients.

State CREP Expenses
PY 2000-2009

	Expended
State Bonus Payment for State Option	\$ 8,074,799.20
NCACSP Cost Share Payments	\$ 1,826,666.00
Soil and Water Conservation Administrative Fees	\$ 54,101.99
State Administration Expenses	\$ 6,229,917.19
NCACSP Technical Assistance	\$ 1,422,998.00
County Funded Technical Assistance	\$ 1,343,405.00
Operating Support	\$ 1,646,922.00
CREP Pilot Program	\$ 12,000.00
Monitoring	\$ 1,333,079.76
Stewardship	\$ 1,631,393.39
Total	\$ 23,575,282.53

CREP has a total of 12 staff positions. Previously, the Clean Water Management Trust Fund paid for up to nine positions (two CREP specialist, three paralegals, two attorneys, one registered surveyor and one survey technician). Currently the agreement between the Division and CWMTF is based on transactional costs. CWMTF reimburses the Division per easement closed and on a per-acre cost for surveying. These funds support three employees of the CREP staff, state appropriations support an additional eight employees and one position was supported by a Section 319 grant until November 2008.

The State pays the Districts up to \$11 per acre for administrative costs incurred processing 30-year and permanent enrollments, plus a fee for permanent enrollments.

The N.C. Agriculture Cost Share Program can pay for a portion of all BMPs proposed for CREP.

Districts in the targeted basins and watershed have technicians whose salaries and operating expenses are paid at 50 percent by the State. The Division has estimated 3.5 FTE's for the current CREP watersheds.

District employees that are paid by the local governments provide technical assistance to CREP. The Division has estimated five FTEs for the current CREP watersheds.

CREP Pilot Program was a partnership with the Tar River Land Conservancy to target potential enrollments in the following counties: Person, Granville, Vance, Warren, Halifax, Franklin, Nash and Edgecombe.

NC CREP has entered into a contract with North Carolina State University to provide the environmental monitoring on CREP sites.

CREP easements will be monitored in conjunction with the DENR Stewardship Program.

NC funded the Programmatic Environmental Assessment needed to complete the expansion proposal.

CREP Total Federal and State Expenditures
PY 2000-2009

CRP Payments (Life of Contract)	\$ 52,204,458
Total Incentive Payment	\$ 1,678,258
Federal Cost Share	\$ 3,025,445
State Expenses for CREP Enrollments	\$ 23,460,614
Total Program Costs	\$ 80,368,775

The total federal and state costs of CREP for program year 2000 through program year 2009 was \$80,368,775. The state contributed a 29% match, thus meeting the requirement for incurring 20% of the total program costs.

The state funds do not include state appropriated and awarded grant funds available, but not yet expended.